NOTES ON THE GENUS *TETRACLEA (VERBENACEAE)*

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As stated in the foreword of other recent papers, lack of time this late in life prevents the preparation of the detailed monograph of this genus as originally planned and previously announced, but it seems worthwhile to place on record here the bibliographic and herbarium notes on the genus assembled by my wife, Alma L. Moldenke, and myself over the past fifty-two years. The herbarium acronyms employed herein are the same as used in all previous papers in this series in this journal and elsewhere since 1934 and are fully explained in Phytologia Memoirs 2: 463--469 (1980) and previously elsewhere.

TETRACLEA A. Gray, Am. Journ. Sci., ser. 2, 16: 98. 1853.

Synonymy: *Tetracleis* A. Gray ex Pfeiffer, Nom. Bot. 2 (2): 1372. 1874. *Tetracleis* "A. Gray ex Pfeiffer" apud Post & Kuntze, Lexicon 553. 1904. *Tetracles* Reko, Bol. Soc. Bot. Mex. 4: 35, sphalm. 1946. *Tetrachloa* Albers ex Mold., Phytol. Mem. 2: 445, in syn. 1980. *Teliclea* Woot. & Standl., in herb.

Bibliography: A. Gray, Am. Journ. Sci., ser. 2, 16: 98. 1853; Torr., Bot. U. S. Mex. Bound. Surv. [Bot. Emory Exped.] pl. 41. 1858; C. Mull. in Walp., Ann. Bot. Syst. 5: 704. 1860; Bocq., Adansonia, ser. 1, 2: 86 & 130 (1862) and 3: 183 & 204--205. 1862; Pfeiffer, Nom. Bot. 2 (2): 1372. 1874; Benth. in Benth. & Hook. f., Gen. Pl. 2 (2): 1220 & 1270. 1876; A. Gray, Synop. Fl. N. Am., ed. 1, 2: 342 & 347 (1878) and ed. 2, 2: 342 & 347. 1886; Baill., Hist. Pl. 11: 76, 92, & 112. 1891; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 209, 212, & 215, fig. 74 E--G. 1895; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1049. 1895; Dalla Torre & Harms, Gen. Siphonog. 435. 1904; Post & Kuntze, Lexicon 553 & 689. 1904; Woot. & Standl., Contrib. U. S. Nat. Herb. 16: 170. 1913; A. Nels. & Macbr., Bot. Gaz. 62: 146. 1916; Prain, Ind. Kew. Suppl. 5, imp. 1, 257. 1921; Stapf, Ind. Lond. 6: 273. 1931; Miranda & Hernandez Xolocotzi, Bol. Soc. Bot. Mex. 28: 67 & 133, pl. 61. 1933; Junell, Symb. Bot. Upsal. 1 (4): 108--110, 203, & 214, fig. 172. 1934; Mold., Geogr. Distrib. Avicenn. 14. 1939; Mold., Suppl. List Inv. Names 2. 1941; Wyman & Harris, Navajo Ind. Ethnobot. 34 & 45. 1941; Mold. in Lundell, Fl. Tex. 3 (1): 14 & 86--87. 1942; Mold., Alph. List Inv. Names 19, 21, & 43. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 12, 14, 18, & 100. 1942; Lundell & al., Am. Midl. Nat. 29: 489--490. 1943; Mold., Phytologia 2: 126. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 1049. 1946; Mold., Phytologia 2: 159. 1946; Reko, Bol. Soc. Bot. Mex. 4: 35. 1946; Mold., Alph. List Inv. Names Suppl. 1: 21. 1947; H. N. & A. L. Mold., Pl. Life 2: 28, 34, & 54. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 23, 25, 26, 32, & 197. 1949; I. M. Johnst., Journ. Arnold Arb. 31: 192--193. 1950; Kearney, List Citat. Place Publ. Spec. Ariz. Pl. [typescript] 108.

1951; Kearney & Peebles, Ariz. Fl., ed. 1, 724 & 730--731. 1951; Lawrence, Taxon. Vasc. Pl., imp. 1, 687 & 819. 1951; McDougall & Sperry, Pl. Big Bend Natl. Park 148. 1951; E. J. Salisb., Ind. Kew. Suppl. 11: 250. 1953; Angely, Cat. Estat. Gen. Bot. Fan. 17: 6. 1956; Mold., Résumé 28, 30, 31, 38, 266, 273, 354, & 470. 1959; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, imp. 1, 724 & 730--731. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 1049. 1960; Prain, Ind. Kew. Suppl. 5, imp. 2, 257. 1960; Rzedowski, Act. Cient. Potos. 4: 65 & 91. 1960; Mold., Résumé Suppl. 3: 7 (1962), 4: 4 (1962), and 5: 4. 1962; Miranda & Hernandez Xolocotzi, Bol. Soc. Bot. Mex. 28: 67 & 133, pl. 61. 1963; Mold., Résumé Suppl. 6: 3 & 4. 1963; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, imp. 2, 724 & 730--731. 1964; Mold. in Shreve & Wiggins, Veg. Fl. Sonor. Des. 2: 1262--1263. 1964; F. A. Barkley, List Ord. Fam. Anthoph. 76 & 215. 1965; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 7, 1109. 1966; Mold., Résumé Suppl. 13: 2 (1966) and 18: 2. 1969; Rickett, Wild Fls. U. S. 3 (2): 362, 366, & [367], pl. 111. 1969; G. W. Thomas, Tex. Pl. Ecol. Summ. 77. 1969; Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1313, 1341--1342, & 1873. 1970; Rickett, Wild Fls. U. S. 4: 542, [543], & 798, pl. 177. 1970; Rouleau, Guide Ind. Kew. 186 & 291. 1970; Lawrence, Taxon. Vasc. Pl., imp. 2, 687 & 819. 1971; Mahler, Key Vasc. Pl. Black Gap, ed. 3, 69, 70, & 104. 1971; Mold., Fifth Summ. 1: 57, 61--63, 74, & 450 (1971) and 2: 641, 760, & 911. 1971; Airy Shaw in J. C. Willis, Dict. Flow. Pl., ed. 8, 1138. 1973; Mold., Phytologia 34: 278 & 511. 1976; A. M. & S. A. Powell, Sida 7: 89. 1977; Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 499 & 511 (1978) and 44: 328, 329, & 511. 1979; Hocking, Excerpt. Bot. A.33: 79 & 87. 1979; Mold., Phytol. Mem. 2: 50, 54, 56, 67, 445, & 578. 1980.

Low erect perennial herbs or subshrubs, basally suffrutescent; stems erect, ascending, or prostrate; leaves simple, exstipulate, deciduous, mostly oblong or ovate, marginally dentate or entire, those in the inflorescence similar but smaller; inflorescence axillary, cymose; cymes pedunculate, 1- or (mostly) 3-flowered; flowers short-pedicellate; calyx gamosepalous, inferior, broadly campanulate, 10-veined, deeply 5-cleft or 5-parted, accrescent, persistent, the lobes subequal; corolla gamopetalous, perfect, infundibular or hypocrateriform, white or yellowish, often red-tinged, medium-size, indistinctly bilabiate, the tube narrowly cylindric, exserted, the limb spreading, 5-parted, the lobes obovate-oblong, slightly unequal or subequal, imbricate; stamens 4, didynamous, fertile, often long-exserted, straight or incurved-ascending, the anterior pair longer; anthers 2-celled, the thecae distinctly parallel, basally free, longitudinaly dehiscent, the connective basifixed; disk present, short, equal; pistil single, bicarpellary; style terminal, long, slender, apically bifid, the branches stigmatiferous, subulate, subequal; ovary superior, compound, apically shortly 4-lobed; ovules descending-amphitropous; fruit not fleshy, composed of 1--4 hard, obovoid, reticulate pyrenes attached to beyond the middle by a broadly keeled areole, the fallen ones not leaving a gynobase; seeds attached laterally, exalbuminous.

Type species: *Tetraclea coulteri* A. Gray.

This is a small genus of only a few known taxa originally classified in the *Verbenaceae* by Asa Gray (1853), reclassified in the *Lamiaceae* by Bentham (1876), Jackson (1895), Briquet (1895), Post & Kuntze (1904), and Prain (1921), and finally placed back in the *Verbenaceae* by Bocquillon (1862), Junell (1934), and Angely (1956), as well as most recent authors. Salisbury (1953), Rouleau (1970), and Airy Shaw (1973) still regard it as a mint. Howell & McClintock (1960) note that "This genus is usually included in the *Labiatae,* but recent authorities consider it to belong to the *Verbenaceae* in which family it was first placed by Asa Gray." Bentham (1876) comments that "Genus habitu floribus et staminibus longis *Trichostomati* affine, ovario et nuculis *Amethysteae* v. *Teucrii*, ab omnibus distinguitur antherarum loculis distinctis parallelis."

Junell's (1934) discussion is sufficiently important to repeat here: "In Engler & Prantl wird dieser Gattung als unsicher in die Tribus *Ajugoideae* unter den Labiaten eingereiht. Baillon..... welcher der Gattung eine ähnliche Stellung eingersumt hat, betont dabei jedoch, dass sie ebensogut bei *Verbenaceae* in der Nähe von *Ovieda (Clerodendron)* und *Caryopteris* eingereiht werden könnte.

"Der Fruchtknotenbau scheint mir zu beweisen, dass die Gattung in *Clerodendreae* unter zu bringen ist. Diese Umplazierung ist eigentlich ganz geringfügig, da, wie wir später sehen werden, *Clerodendreae* und *Ajugeae* einander sehr nahe stehen. *Tetraclea* kann wahrscheinlich als eine Übergängstypus zwischen diesen beiden Gruppen betrachtet werden........Die beiden Fruchtblätter sind nur ganz wenig miteinander verwachsen. Wie bei gewissen *Clerodendron*-Arten und den unmittelbar vorstehend behandelten Gattungen dringt nämlich von der Fruchtknotenhöhle in jede Plazenta eine tiefe Furche ein. Die mittleren Partien der Fruchtblätter besitzen ziemlich starke Anschwellungen. Die Samenanlagen sind oberhalb ihrer Mitte inseriert.

"Auch im übrigen spricht der Blütenbau für die Stellung der Gattung in dieser Subtribus. Eigentlich weicht nur die Frucht ab, und zwar dadurch, dass sie nicht fleischig ist. Sie besteht nämlich aus vier Nüsschen. Diese Nüsschen besitzen jedoch ungewöhnlich dicke Wandungen, welche, wie ich mich überzeugt habe, Steinzellen enthalten. Der Fruchtbau muss offenbar nicht notwendigerweise ein Hindernis für die Einreihung der Gattung in diese Subtribus bilden. Bei gewissen *Clerodendron*-Arten ist übrigens die Fruchtwandung nur ganz wenig fleischig."

He summarizes the situation thus: "*Tetraclea* hat Briquet als unsicher in *Ajugoideae* eingereiht. Der Fruchtknotenbau spricht jedoch dafür, dass die Gattung in der Subtribus *Clerodendreae* unterzubringen ist. Die Frucht ist allerdings nicht fleischig, die Fruchtwand ist aber sehr dick und erhält Steinzellen. Mit Rücksicht auf der Stellung, welche ich *Ajugeae* erteilt habe, ist die Umplazierung der Gattung eigentlich ganz unbedeutend."

An artificial key to the accepted taxa:

1. Planta annual, densely puberulent throughout with gland-tipped hairs; leaves sessile or subsessile, thick, elliptic, less than 2 cm. long.......................*T. viscida.*
1a. Plants perennial, the pubescence eglandular; petioles to 1 cm. long; leaf-blades thinly chartaceous or submembranous.
  2. Leaf-blades mostly broadly ovate, at least the smaller ones entire.
    3. Corolla relatively small, to 1.5 cm. long in all; stamens well exserted, curvate.............*T. coulteri.*
    3a. Corolla larger, the tube alone 1.6--1.7 cm. long or twice as long as the calyx; stamens straight, exserted less than 5 mm. from the corolla-mouth, not beyond the usually erect dorsal corolla-lobe...................... *T. coulteri* f. *subinclusa.*
  2a. Leaf-blades mostly narrowly oblong and conspicuously toothed......................*T. coulteri* f. *angustifolia.*

TETRACLEA COULTERI A. Gray, Am. Journ. Sci., ser. 2, 16: 98. 1853.

Synonymy: *Tetraclea wrightii* A. Gray ex Mold., Alph. List Inv. Names 43, in syn. 1942. *Tetraclea coulteri* var. *coulteri* [A. Gray] ex G. W. Thomas, Tex. Pl. Ecol. Summ. 77. 1969. *Tetraclea coulteri* var. *coulteri* Thomas ex Mold., Phytologia 34: 278, in syn. 1976. *Tetradymia coulteri* Gray, in herb.

Bibliography: A. Gray, Am. Journ. Sci., ser. 2, 16: 98. 1853; Torr., Bot. U. S. Mex. Bound. Surv. pl. 41. 1858; Bocq., Adansonia, ser. 1, 3: 205. 1862; Briq. in Engl. & Prantl, Nat. Pflanzenfam. 4 (3a): 212 & 215, fig. 74 E--G. 1895; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 2: 1049. 1895; A. Nels. & Macbr., Bot. Gaz. 62: 146. 1916; Stapf, Ind. Lond. 6: 273. 1931; Miranda & Hernandez Xolocotzi, Bol. Soc. Bot. Mex. 28: 67 & 133, pl. 61. 1933; Junell, Symb. Bot. Upsal. 1 (4): 108 & 110, fig. 172. 1934; Mold., Geogr. Distrib. Avicenn. 14. 1939; Mold., Suppl. List Inv. Names 2. 1941; Wyman & Harris, Navajo Ind. Ethnobot. 34 & 45. 1941; Mold., Alph. List Inv. Names 19, 21, & 143. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 12, 14, 18, & 100. 1942; Mold. in Lundell, Fl. Tex. 3 (1): 86--87. 1942; Lundell & al., Am. Midl. Nat. 29: 489 & 490. 1943; Mold., Phytologia 2: 126. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 2: 1049. 1946; Mold., Phytologia 2: 159. 1946; H. N. & A. L. Mold., Pl. Life 2: 54. 1948; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 23, 25, 26, 32, & 197. 1949; Kearney, List Citat. Place Publ. Spec. Ariz. Pl. [typescript] 108. 1951; Kearney & Peebles, Ariz. Fl., ed. 1, 730--731. 1951; McDougall & Sperry, Pl. Big Bend Natl. Park 148. 1951; Mold., Résumé 28, 30, 31, 38, 266, 273, 354, & 470. 1959; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, imp. 1, 730--731. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 2: 1049. 1960; Rzedowski, Act. Cient. Potos. 4: 65 & 91. 1960; Mold., Résumé Suppl. 3: 7 (1962), 4: 4 (1962), 5: 4 (1962), and 6: 3 & 4. 1963; Howell & McClintock in Kearney &

Peebles, Ariz. Fl., ed. 2, imp. 2, 730--731. 1964; Mold. in Shreve & Wiggins, Veg. Fl. Sonor. Des. 2: 1262--1263. 1964; Mold., Résumé Suppl. 13: 2 (1966) and 18: 2. 1969; Rickett, Wild Fls. U. S. 3 (2): 366 & [367], pl. 111. 1969; G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1342 & 1873. 1970; Rickett, Wild Fls. U. S. 4: 542, [543], & 798, pl. 177. 1970; Mahler, Key Vasc. Pl. Black Gap, ed. 3, 70. 1971; Mold., Fifth Summ. 1: 57, 61--63, 74, 450, & 464 (1971) and 2: 641 & 911. 1971; Mold., Phytologia 34: 278. 1976; A. M. & S. A. Powell, Sida 7: 89. 1977;Mold., Phytologia 38: 499 (1978) and 44: 328. 1979; Hocking, Excerpt. Bot. A. 33: 79. 1979; Mold., Phytol. Mem. 2: 50, 54, 56, 57, 445, & 578. 1980.

Illustrations: Torr., Bot. U. S. Mex. Bound. Surv. pl. 41. 1858; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 212, fig. 74 E--G. 1895; Miranda & Hernandez Xolocotzi, Bol. Soc. Bot. Mex. 28: 133, pl. 61. 1933; Junell, Symb. Bot. Upsal. 1 (4): 110, fig. 172. 1934; Rickett, Wild Fls. U. S. 3 (2): [367], pl. 111 [in color] (1969) and 4: [543], pl. 177 [in color]. 1970.

A low and erect or more or less decumbent , bushy, herbaceous perennial [or "long-lived annual" according to Powell & Turner] from a deep fleshy taproot or rootstock, branched underground, with a suffrutescent branched base, or even a dwarf shrub, strongly pungent or "vile" fetid-scented with the odor of burdock or *Cucurbita foetidissima*; stems several, branching, obscurely tetragonal, ascending or spreading to decumbent, usually about 15--40 cm. tall; branchlets very slender, gray, obtusely tetragonal, densely puberulent with minute, eglandular, appressed, strigose, whitish hairs; nodes not annulate, not swollen; principal internodes 0.9--3.2 cm. long; leaves decussate-opposite, rather thinly chartaceous or submembranous [rarely leathery], gray, petiolate, strongly odoriferous; petioles slender, 4--10 mm. long, flattened, distinctly margined from apex to base, appressed-puberulent throughout, eglandular, basally not ampliate; leaf-blades thin-chartaceous or submembranous, rather uniformly bright-green on both surfaces, ovate, 1.4--4 cm. long, 6--18 mm. wide, apically sharply acute and mucronulate, marginally irregularly dentate with 2 or 3 teeth per side (the teeth coarse, broadly triangular, divergent, apically acute) or the smaller ones entire, basally acute or acuminate and prolonged into the petiole, finely puberulent with whitish, substrigose, eglandular hairs on both surfaces; midrib slender, plane above, prominulous beneath; secondaries very slender, 1--3 per side, ascending , slightly arcuate, plane and mostly obscure above, prominulous beneath, not conspicuously anastomosing; vein and veinlet reticulation very sparse, obscure or indiscernible on both surfaces; inflorescence axillary, cymose, the cymes few-flowered , mostly 3-flowered (sometimes reduced to 2 or even 1 flower); peduncles very slender, 3--8 mm. long, densely puberulent; flowers almost actinomorphic; calyx deeply 5-cleft, the tube short , turbinate, the lobes lanceolate, twice the length of the tube, apically subulate to filiform; corolla pinkish or cream-color, tinged with red outside, nearly salverform during anthesis, to 1.5 cm. long, the tube narrow, surpassing the calyx, the limb globular and erect but oblique in bud, the lobes subequal, oval or oblong-obovate to elliptic-obovate, similar and equally spreading during anthesis or the 2 lower ones slightly cupped around the 4 recurved stamens, marginally entire, the 3 lower ones obscurely more united basally; stamens exserted from the corolla; filaments filiform, cream-color, involute in bud; anthers oblong, red, the thecae permanently parallel and distinct; style cream-color; ovary slightly 4-lobed; pyrenes pyriform, very strongly and coarsely reticulate, finely pubescent, the commissural areole large, ventral, somewhat rugose; seeds descending; chromosome number: n = 21 or 20 II.

Gray (1853) gives an interesting account of the early history of this plant, saying that it "first came to my notice in the Texano-New Mexican collection made by the indefatigable Mr. Charles Wright, in the year 1849. In the same or the preceding year, it was likewise collected by the late Dr. J. Gregg, in the Northern part of Mexico. Fine specimens also were gathered by Mr. Wright on his second journey, while attached to the scientific corps of the Boundary Commission. In 1851, while under the command of Col. Graham, he collected it on the northern border of the Mexican state of Sonora; in 1852, while returning under the orders of Major Emory, he again met with it in the western part of Texas. I presume it has likewise been found by Dr. C. C. Parry, and Dr. J. M. Bigelow, during the survey of the Rio Grande from El Paso downwards; but I have seen no specimens from them. Specimens are in both of Mr. Wright's distributed collections. I have, moreover, just detected it in the late Dr. Coulter's Mexican collection, whose name, as being the first discoverer, the species may appropriately bear. The natural order to which the plant in question belongs is not very evident at first view. In Mr. Wright's notes, made at the time of gathering it, the plant is mentioned as a doubtful *Borraginacea*;--a view suggested by the deeply 4-lobed fruit, and the nearly regular, pentamerous calyx and corolla. But the leaves are opposite, and the stamens are only four in number. The latter characters, along with the quadrinuculate fruit, and the axillary cymulose inflorescence, would incline us to refer the plant to the order *Labiatae*; which again is forbidden by the regular corolla, the apparently equal stamens, and the amphitropous descending ovule. The latter character points to the true affinity of the genus, which unquestionably should be placed in the Vitaceous division of the order *Verbenaceae;* notwithstanding the deeply four-lobed ovary, and the fruit of four nucules. This remarkable character may well furnish the name of the genus;-- which I accordingly form of τέτρα, four, and χλείω, to close or shut up, referring to the four closed nutlets of the fruit." He cites the following collections, the first-named of which may well be regarded as the type of the species and genus: *Coulter 1172, Gregg 502,* and *Wright 462, 1513, & s.n.* [Escondido Springs, 1852]. The Coulter collection is stated as having been collected in "Mexico" without further locality mentioned.

Collectors have found this plant growing along dry roadsides and washes, in dry open ground, scrub deserts, dry gullies, and open country, on the open slopes of igneous hills, "mesas, llanos y cerros", sandy and alkaline flats, rocky hills and slopes, and level land, on limestones hills and hillsides, gravelly hills, limestone-sandstone hills, and chaparral plains, on valley floors and cedar-sotol mesa-tops and stony mountainsides, in desert roadside ditches, among low bushes and low scrub vegetation, among "roadside weeds dominated by *Larrea*", in canyons and the gravel washes therefrom, in dry or open and rocky soil, gravel, deep sandy or light grayish-tan sandy loam, brick-red or "tight" red sandy soil, sandy- or dry sandy-clay, loose sand, limestone or caliche soil, in mesquite grassland, in shallow soil with much rock and gravel, and in low shrub areas on grassland, at altitudes of 350--2195 m., in anthesis and in fruit from March to November.

The corollas are described as having been "white" on *Vandergriff 37*, "greenish-white" on *Whitehouse 8750*, "cream-white" on *Correll & Schweinfurth 15700*, "cream" on *Correll & Johnston 19978*, *Correll & Wasshausen 27905*, *Henrickson 12174a* & *12497*, *Johnston & al. 11337*, *Parks & al. 2050*, *Warnock & McBryde 14968*, and *Whitehouse 14744*, "pale-cream" on *Wiggins & Rollins 179*, "cream-white with purple tinge" on *Henrickson & Lee 15854*, "cream tinged with pink-maroon" on *Henrickson & Lee 16021*, "cream tinged with red or pink" on *Wood 791*, "cream or tinged red" on *McVaugh 8255*, "cream- or creamy-yellow" on *Powell & Turner 2690* and *Webster 424*, "cream-yellow, pink-tinged in the tube" on *McVaugh 18499*, "cream to orange" on *Warnock & Turner 721*, "pink-cream" on *Parker 7259*, "pinkish" on *Lundell & Lundell 9966*, "flesh-color" on *Powell & al. 1581* and *Turner & Tharp 53-478*, "flesh-yellow" on *McCart 7446*, "pale yellowish-green (near 75Y9/6)" on *Straw & Forman 1522*, "yellow" on *Crutchfield 92* and *Mick & Roe 6*, "yellowish" on *Lundell & Lundell 14183* and *Rzedowski 6265*, "light-yellow" on *Smith & Butterwick 76*, "pale-yellow" on *White 2145*, "yellow or dingy-white" on *Johnston & al. 3556*, "yellow with some pink" on *Henrickson & Wendt 12278*, "dull-yellow" on *Correll & Rollins 23692*, and "yellow within, red outside" on *Henrickson 6425*.

McVaugh reports the species "locally abundant under pines", while Mears found it "common with *Melampodium, Zinnia, Baileya,* & *Bahia*".

In Texas -- Powell found it in *Larrea-Prosopis* association on rocky limestone hillsides in Brewster County, where Rowell encountered it in sotol-*Agave lechequilla* association in rocky limestone loam; in Ector County Collins found it in deep sand of the high plains dominated by mesquite and grasses; in Pecos County McVaugh reports it "locally abundant under pinyons on rocky limestone steppes", Warnock refers to it as "infrequent in limestone soil"; in Presidio County Muller encountered it on shrubby grassland transition zone, while Warnock describe it as "frequent" along roadsides; in Starr County Correll & Johnston found it only "occasional" in gravelly soil; in Terrell County Parks & al. describe it as "infrequent"; in Tom Green County Bray reports it "common in chaparral clumps", while Smith found it inhabiting "dry slopes and moist areas at base of slopes, on a limestone base"; and in Val Verde County Smith & Butterwick refer to it as "rare". Warnock & Turner as "infrequent", Warnock & McBryde as "infrequent in limestone soil", McVaugh as "scarce in open stony ground", but Warnock also calls it a "frequent and widespread perennial, a good dove and quail feed".

In Arizona -- Hanson reports it "infrequent in sandy soil" of Coconino County, while Parker encountered it in "rocky soil with mesquite-palo verde association on mountain foothills" and in rocky soil on slopes in Emory oak - Mexican blue oak association in Pima County.

In New Mexico -- Higgins found it growing in "gravelly limestone soil of grassland community" and in "wet meadows in *Sporobolus-Juncus-Scirpus* community".

In Chihuahua -- Chiang, Wendt, & Johnston found it "in interface between pastizal and matorral inerme desértico on low hills of basic igneous rock, in thin sandy soil with *Bouteloua gracilis* and *Larrea tridentata*" and "in arroyo and fan areas in gravelly calcareous sandy loam with *Larrea tridentata, Acacia neovernicosa,* and *Dasylirion* sp.", also "in areas of izotal on midslopes of steep limestone, with chaparral on top, matorral desértico inerme on lower portions, mostly north-facing, in calcareous gravelly soil with *Dasylirion, Yucca,* and *Agave* (higher up with *Quercus, Garrya* etc." and "in matorral desértico inerme and degraded pastizal on steep limestone slopes of small basalt mesas in calcareous gravel or gravel derived from extrusive igneous rocks, with *Agave lecheguilla, Bouteloua ramosa, Ephedra antisyphilitica, Acacia glandulosa,* and *Viguiera*", also in "matorral inerme subdesértico on limestone-like bedded volcanic ash and calcareous gravelly soil with *Forestiera angustifolia, Rhus microphylla, Cassia wislezenii, Acacia glandulosa, Ephedra antisyphilitica,* and *Parthenium incanum*".

In Coahuila -- Chiang and his associates have encountered the plant "in matorral desértico con espinas laterales on steep limestone hills in calcareous gravel with *Hechtia texensis, Acacia schottii,* and *Larrea tridentata*" and in "caliche with *Condalia viridis, Berberis trifoliata, Flourensia cernua,* and *Larrea*"; Henrickson reports it as an "infrequent gray-green leaved perennial on gypsum with *Fouquieria shrevei, Agave, Selaginella, Petalonyx,* and *Hechtia*" and "an infrequent plant on clay flats with *Fouquieria, Coldonia, Agave, Larrea, Jatropha, Sericodes,* etc."; "also frequent with *Larrea, Selinocarpus, Grusonia, Agave lecheguilla, Tecoma,* etc." and "on rocky margins of arroyo"; Mick & Roe found it growing "in desert with extensive desert pavement and *Agave, Aloë,* and cacti common"; Ward & Lott report it as inhabiting areas of low shrub vegetation of *Parthenium incanum, P. argentatum, Agave lecheguilla, Ephedra antisyphilitica, Acacia berlandieri, Mimosa,* sotol, etc.

In Durango -- Straw & Forman report the species common in sandy washes.

In Jalisco -- Rzedowski reports it from "terrenos poco inclinados con vegetacion de pastizal".

In San Luis Potosi -- Henrickson found the plant "in canyons with *Agave lecheguilla, Larrea, Acacia, Prosopis, Cordia,* etc." and "in Chihuahuan Desert on limestone hills with *Prosopis, Acacia, Opuntia, Hechtia, Dasylirion,* etc."

In Tamaulipas -- Stanford and his associates report it from a "broad damp riverbed with varied vegetation of large shrubs, small trees, and herbs".

In Zacatecas -- McVaugh reports it "locally abundant on hills with grass, *Ipomoea,* and cacti".

Kearney & Peebles (1960) assert that in Arizona the species is found at altitudes of "4500 feet or lower", flowering from April to August. Wiggins (1964) says that it occurs "In sandy clay soil, dry open ground, and broad damp riverbeds, chiefly in the foothills. Sonoran Zones, southwestern Pima County, Arizona, to Texas and south to Puebla". Gray (1878) says: "Rocky hills, S.W. Texas to Arizona", flowering in summer. Rickett (1969) asserts: "April to September: on rocky hills from western Texas to Arizona and Mexico". In Lundell (1942) material is cited from Brewster, El Paso, Jeff Davis, Midland, and Wood Counties, Texas.

Dr. F. Miranda, in a letter to me dated October 15, 1947, cites *Patoni s.n.* from Tehuacan and *Miranda 1989* from Matamoras, Puebla.

A. M. Powell has determined the chromosome number as n = 21 on the basis of *Powell & Turner 2690* and n = 20 II on *Turner & Turner 7090.*

A single vernacular name, "wóláčí.ˀʌbéz", is reported for the species.

McVaugh 10648 exhibits all the leaves marginally entire; *Howell 24400* has the calyx only 4-lobed; *Chiang, Wendt, & Johnston 8739c* & *9695e* have very small flowers and unusual teeth on the leaf-margins. Lundell (1943) notes that *Lundell & Lundell 9966,* from Hidalgo County, Texas, has "the calyx lobes....filiform at [the] apex rather than subulate, [but] additional collections are needed to determine if the difference is of varietal importance.

An unknown hand has suggested of the sheets of *Warnock & Barkley 14798M* & *14803M* in the University of Texas herbarium that these collections may represent what is now known as f. *subinclusa.*

Tetraclea wrightii, referred to in the synonymy (above), is a cheironym apparently based on *C. Wright 1512* in the Torrey Herbarium. *C. Wright 458* is a mixture with *Lantana macropoda* Torr.

Material of typical *T. coulteri* has been misidentified and distributed in some herbaria as *T. coulteri* var. *angustifolia* (Woot. & Standl.) A. Nels. & Macbr., *T. subinclusa* I. M. Johnst., *Teucrium laciniatum* Torr., *Trichostema arizonicum* A. Gray, *Ruellia* sp., and *Acanthaceae.* On the other hand, the *Butterwick & Lott 3675, F. S. Earle s.n.* [Barstow, June 1901], *Hahn s.n., Higgins 6706* & *6778, Lehto, Keil, & Pinkava 5315, 5537, 5661, 5675,* & *5798, Paray 2625, Rzedowski 6356* & *7991, Small & Wherry*

12082, Waterfall 7757, & *Whitehouse 16883,* distributed as typical *T. coulteri,* are better regarded as representing f. *angustifolia* (Woot. & Standl.) Mold., while *Correll & Johnston 20205* is *T. coulteri* f. *subinclusa* (I. M. Johnst.) Mold., *Albers & Haskell 49278* is *T. viscida* Lundell, *Cohn & Barkley 13176* is *Isanthus brachiatus* (L.) B.S.P. in the *Lamiaceae,* and *Taylor & Taylor 15630* is something in the *Nyctaginaceae.*

Citations: TEXAS: Andrews Co.: *Vandergriff 37* (Lk). Bexar Co.: *Parks 43130* (Au--127182), *44266* (Au--127215). Brewster Co.: *Cory 53126* (Sm); *Marsh 46* (Au--213990); *A. M. Powell 2739* (Au); *Rowell 11227* (Lk); *E. D. Schulz s.n.* [Alpine, May 1922] (N); *Steiger 652* (N); *Turner & Tharp 53-478* [Turner 3250] (Au--127208); *Turner & Turner 7090* (Ld); *Warnock 21408* (Au--127269), *T.40* (Au--127210); *Whitehouse 11476* (Sm); *M. S. Young s.n.* [9/17/15] (Au--127191). Concho Co.: *S. Hayes s.n.* [Concho, May 21st, 1858] (N). Crockett Co.: *Tharp 43-824* (Au--127214, N). Dimmit Co.: *Correll & Johnston 19508* (Ld); *Johnston, Tharp, & Turner 3538* (Au--127218, St), *3556* (Au--127217). Ector Co.: *T. Collins 200* (Lk), *263* (Lk), *1276* (Lk). El Paso Co.: *J. I. Carlson s.n.* [El Paso, May 9, 1915] (Gg --24499); *M. K. Clemens 11* (Gg--24496); *Hitchcock, Rethke, & Raadshooven 4336* [U. S. Nat. Arb. 146068] (Gg--298998, Ld); *Whitehouse 8750* (Au--127192, Mi, Sm); *C. Wright 462* (N). Hidalgo Co.: *Lundell & Lundell 9966* (Ld, Mi); *E. J. Walker 14* (Au--127193). Jeff Davis Co.: *Earle & Tracy 159* (Au--127194, N), *299* (N); *S. M. Tracy 299* (N). Jim Hogg Co.: *A. D. Wood 791* (Au--253283). Kimble Co.: *J. Reverchon 1386* (Pa). Midland Co.: *S. M. Tracy 7988* (N). Pecos Co.: *R. McVaugh 10648* (Au--235971, Ld, N); *Turner & Tharp 3160* (Au--127181); *Warnock 10492* (Ld), *10648* (Mi), *46206* (Au--65955). Presidio Co.: *Correll & Rollins 23692* (N); *Correll & Wasshausen 27905* (Ld); *Hinckley 1056* (Au--127211, N, N, Sm), *1335* (N); *C. H. Muller 8412* (St); *Warnock 20707* (Au--127186), *T. 58* (Au--127206). Reeves Co.: *Parks Rx.3108* (Au--127187). Starr Co.: *Correll & Johnston 18073* (Ld); *Ramos, Sandoval, Salazar, & McCart 7866* (Au--222226); *R. Runyon 17* (Au--269968); *Tharp s.n.* [June 30, 1950] (Au--193869); *A. D. Wood 724* (Au--247077), *780* (Au--253291). Terrell Co.: *Lundell & Lundell 14183* (Ld, N); *Parks, Turner, & Warnock 2050* [139] (Au--127184); *Webster 424* (Au--127201). Tom Green Co.: *Baird 4* (Au--248280); *Bray 345* (Sm); *Correll & Johnston 24618* (Ld); *McGenee 75* (Ne--128314); *Rowell 15270* (Sl); *C. Smith 159* (N). Val Verde Co.: *Albers 46138* (Au--165956); *Davies & Turner 79230* (Au); *M. E. Jones 26193* (Gg--251569); *R. McVaugh 8255* (Au--179031, Mi); *Smith & Butterwick 76* (Ld); *Warnock 11233* (Ld, Ws); *Warnock & McBryde 14968* (Ld); *Warnock & Turner 721* (Ld); *Whitehouse 19744* (Mi). Webb Co.: *Baird s.n.* [Oct. 1960] (Au--195729); *Benavides 77* (Au--233313); *D. Cardenas 92* (Ld); *McCart 7446* (Ok); *Sanchez 46* (Ld); *Soto, Hererra, & McCart 8071* (Au--222227); *Vergara, Arreola, Davila, Hein, & McCart 8599* (Au--236368). Zapata Co.: *Bernal 28* (Ld); *Correll & Schweinfurth 15700* (Ld). County undetermined: *C. Wright 458* in part (Du--177392 in part). NEW MEXICO: Chaves Co.: *Higgins 8698* (N); *Crutchfield 92* (Ld). Dona Ana Co.: *F. R. Fosberg S.4054* (Gg--298997); *Plank s.n.* [July 1894] (N); *Wooton* *s.n.* [near Las Cruces, Aug. 12, 1895] (C, N); *Wooton & Standley s.n.* [Oct. 15, 1907; Herb. Field Mus. 27435] (Ws). Grant Co.: *Mearns 2306* (N). Guadalupe Co.: *Higgins 9085* (N). Sierra Co.: *Barneby 3052* (N); *Mrs. J. M. Beals s.n.* [Lake Valley, June 1904] (Mi); *O. B. Metcalfe 1280* (Gg--24498). Socorro Co.: *Plank s.n.* [August 20, 1895] (N). County undetermined: *Herb. Columbia Univ. s.n.* (C); *C. Wright 1512* (T). ARIZONA: Cochise Co.: *Barkley 14A 545c* (Au--127225); *Eastwood 5598* (Gg--24497); *C. B. Wolf 2548* (Gg--174450). Coconino Co.: *Hanson A.234* (N), *A.234a* (Au--127226); *J. T. Howell 24400* (Gg--342812); *Ripley & Barneby 4899* (Gg--302318). Pima Co.: *Gilman 67* (N), *153* (N); *Griffiths & Thornber 3341* (N); *A. R. Moldenke 148* (Fg, Z); *K. F. Parker 7259* (Gg--356536), *7449* (Gg--371779); *Peebles & Harrison 6991* (N); *Pringle s.n.* [Tucson, April 27, 1883] (Bc, Pa); *Thornber 2327* (Ld, N), *s.n.* [Wilmot, August 22, 1902] (N); *Toumey s.n.* [Tucson, Oct. 11, 1894] (N). Yavapai Co.: *H. H. Rusby 783* (Mi, Pa), *s.n.* [Ft. Verde, June 22, 1883] (C). County undetermined: *Eisen s.n.* [June 1892] (N). MEXICO: Chihuahua: *Chiang, Wendt, & Johnston 8695e* (Ld), *8739c* (Ld); *Henrickson & Lee 15854* (Au); *Johnston, Wendt, & Chiang C. 11337* (Ld), *11432a* (Ld); *Edw. Palmer 176* (N); *Pringle s.n.* [mesas y cerros, 17 Set. 1886] (Me), *s.n.* [llanos y cerros, 17 Set. 1886] (Me); *Wenst, Chiang, & Johnston 9794* (Ld); *S. S. White 2145* (Mi); *C. Wright s.n.* [Depprich 7797] (Sm). Coahuila: *Chiang, Wendt, & Johnston 8263b* (Ld); *Cole, Hinckley, & Pinkawa 4161* (Te--67196); *Henrickson 6727* (Ld), *12174a* (Ld), *12497* (Ld); *Henrickson & Lee 16021* (Au); *Henrickson & Wendt 12278* (Ld); *Johnston, Wendt, Chiang, & Saustrup 12347* (Ld); *Kenoyer & Crum 2540* (Mi), *2657* (Mi); *Latorre 83* (Au--225508); *Mick & Roe 6* (Ws); *Edw. Palmer 121* (N); *Powell, Patterson, & Ittner 1581* (Au--267754); *Powell & Turner 2690* (Ld); *Warnock & Barkley 17498M* (Au--127224), *14803M* (Au--127223); *Wendt & Lott 1233* (Ld); *Wynd & Mueller 477* (N, St), *485* (Me, Mi, N). Durango: *Correll & Johnston 19978* (Ld); *E. W. Nelson 4722* (N); *Straw & Forman 1522* (Mi); *Waterfall s.n.* [August 11, 1959] (St); *Waterfall & Wallis 13361* (St), *13750* (St). Hidalgo: *Mears & Mears 1598* (Au--257818); *Purpus 1413* (N). Jalisco: *J. Rzedowski 14212* (Ip, W--243660). Nuevo León: *R. F. Smith M.628* (Au--208811). Puebla: *F. Miranda 1989* (Me); *Patoni s.n.* [Tehuacan, Setiembre 1916] (Me). San Luis Potosi: *Henrickson 6425* (Ld); *J. Rzedowski 6265* (Ip), *6756* (Au--243742, Ip); *Schaffner 356* [Herb. Prager 18758] (Gg--87682), *636* (Me, N). Sonora: *Wiggins & Rollins 179* (Mi, N). Tamaulipas: *Stanford, Retherford, & Northcraft 933* (N). Zacatecas: *R. Mc Vaugh 18479* (Mi, N).

TETRACLEA COULTERI f. *ANGUSTIFOLIA* (Woot. & Standl.) Mold., Phytologia 44: 328. 1979.

Synonymy: *Tetraclea angustifolia* Woot. & Standl., Contrib. U. S. Nat. Herb. 16: 170. 1913. *Tetraclea coulteri* var. *angustifolia* (Woot. & Standl.) A. Nels. & Macbr., Bot. Gaz. 62: 146. 1916. *Clerodendrum nelmesianum* Mold., Geogr. Distrib. Avicenn. 14, nom. nud. 1939. *Clerodendron malmesianum* Mold., Suppl. List Inv. Names 2, in syn. 1941. *Tetraclea coulteri angustifolia* (Woot. & Standl.)

A. Nels. & Macbr. ex Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. 1873. 1970; Fifth Summ. 2: 641, in syn. 1971. *Teliclea angustifolia* Woot. & Standl., in herb.

Bibliography: Woot. & Standl., Contrib. U. S. Nat. Herb. 16: 170. 1913; A. Nels. & Macbr., Bot. Gaz. 62: 146. 1916; Prain, Ind. Kew. Suppl. 5, imp. 1, 257. 1921; Mold., Geogr. Distrib. Avicenn. 14. 1939; Mold., Suppl. List Inv. Names 2. 1941; Mold., Alph. List Inv. Names 43. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 12, 14, & 100. 1942; Mold. in Lundell, Fl. Tex. 3 (1): 87. 1942; Mold., Phytologia 2: 159. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 23, 25, & 197. 1949; Kearney, List Citat. Place Publ. Spp. Ariz. Pl. [typescript] 108. 1951; Kearney & Peebles, Ariz. Fl., ed. 1, 730--731. 1951; Mold., Résumé 28, 30, 354, & 470. 1959; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, imp. 1, 730--731. 1960; Prain, Ind. Kew. Suppl. 5, imp. 2, 257. 1960;Mold., Résumé Suppl. 3: 7 (1962), 5: 4 (1962), and 6: 3 & 4. 1963; Howell & McClintock in Kearney & Peebles, Ariz. Fl., ed. 2, imp. 2, 730--731. 1964; Mold., Résumé Suppl. 18: 2. 1969; Rickett, Wild Fls. U. S. 3 (2): 366. 1969; G. W. Thomas, Tex. Pl. Ecolog. Summ. 77. 1969; Mold. in Correll & Johnston, Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1342 & 1873. 1970; Rickett, Wild Fls. U. S. 4: 542 & 798. 1970; Mold., Fifth Summ. 1: 57, 61, 74, & 450 (1971) and 2: 641 & 911. 1971; Mold., Phytologia 44: 328. 1979; Mold., Phytol. Mem. 2: 50, 54, 56, 67, 445, & 578. 1980.

This form differs from the typical form of the species in having its leaf-blades in general more narrowly oblong and conspicuously toothed. It is, at best, a poorly defined form. most certainly not deserving the specific or even varietal status some authors have conferred upon it.

Collectors refer to it as an "annual" or perennial herb, as an herb with a perennial rootstock, or as an erect root-suckering herb, the foliage gray-green, the flowers fetid, the calyx 4- or 5-parted, and the corolla composed of 5 petals. Howell & McClintock (1960) note that "specimens from Cochise County [Arizona] may be referable" to this form, but have "more slender, less pubescent, narrower calyx lobes, smaller corollas, [and] more strongly reticulate nutlets but there seems to be intergradation with typical *T. coulteri*." They cite *Ripley & Barneby 4899* and *J. T. Howell 24400* from Coconino County, noting that "both have 4-lobed calyx and plants with [both] 4- and 5-lobed calyxes have been collected elsewhere."

Recent collectors have found f. *angustifolia* growing in "interfirm alluvium", deep sand of moving dunes, fine sandy loam of saline flats, gypseous gravel and clay, red sandy loam of open mesquite grasslands, limestone or red sandy soil, "gypsum soil on level plains in *Gutierrezia-Prosopis* association", sandy or gravelly soil in general, and in the gravel wash of canyons, in desert scrub or grassland communities, in dry arroyos, rocky desert grassland, deep sandy loam, and gravelly calcareous soil along dry creekbeds, in "shallow soil with rock and gravel", in "buff silt of alluvial cover", and in "deep sandy soil dominated by mesquite and creosotebush", on gravelly ridges, dry creek banks, high open plains, limestone hills, "level limestone upland", sandy, limey or gypsum flats, rocky hillsides, *Larrea*-covered bajada, desert floors, saline soil banks, and "interdune flats of sandy loam" or "on arid grassy plains of reddish sandy loam", as well as "under bushes with *Agave lecheguilla* on flats", at altitudes of 750--2150 m., in flower and fruit from April to December.

The corollas are said to have been "white" on *Correll & Johnston 19350* and *Hinckley 1928*, "cream-white" on *Stuessy 945*, "yellowish-white" on *Johnston 2730*, "ivory-color" on *Muller 8412*, "cream" on *Correll & Johnston 19989, Ferris & Duncan 2492, Rowell 8298, Warnock 5550, Warnock & Hinckley BG.184, Warnock & McBryde 14862*, and *White 2451*, "cream-yellow" on *Henrickson 6202* & *6968* and *Powell 2194*, "yellowish" on *Lundell & Lundell 14289, Rzedowski 7991*, and *White 2048*, "pale-yellow" on *Powell 2423*, "dull-yellow" on *Correll & Rollins 23692*, "yellow" on *White 2188*, "yellowish with purple lines" on *Henrickson 5678*, and "lobes pinkish, yellowish within" on *Lundell & Lundell 14210*. Buds were specially collected along with *Turner & Butterwick 510*.

In Texas collectors report the plant as follows: Lundell (1942) "in depressions and on banks, especially on dry rocky plains" from Terrell to Presidio and Hudspeth Counties. In Brewster County: rare (Warnock) or infrequent (Warnock & Hinckley) or "locally frequent in rocky creekbeds" (Rowell). In Crane County: "an infrequent ill-smelling perennial herb" (Warnock). In El Paso County: frequent or infrequent and widespread; an excellent dove feed" (Warnock). In Pecos County: infrequent or frequent in limestone soil (Warnock). In Presidio County: infrequent on low hills (Warnock) or common on rocky slopes in shrubby grassland of transition foothills (Muller). In Terrell County: frequent (Warnock & McBryde) and in depressions and on banks of dry rocky plains (Palmer). In Winkler County: occasional with many of the shrubby dominants of the Chihuahuan Desert (Rowell).

In New Mexico - Eddy County: infrequent on sandy roadsides with *Solanum rostratum, Datura stramonium*, and *Bothriochloa* (Smith & al.)

In Chihuahua: common on roadsides (Engard & Gentry, Andrew & Alison Moldenke) and "a scattered annual on open Chihuahuan Desert flats with *Larrea, Parthenium, Yucca, Opuntia, Allionia, Flourensia*, etc. in shallow sandy-clay soil".

In Coahuila: fairly common on grassy flats and dry sandy hillsides in the calcareous foothills (Stewart) or "frequent with *Hilaria, Prosopis, Opuntia, Larrea*, etc.", "on sandy flats with *Larrea, Acacia, Opuntia, Jatropha*, etc.", and in open Chihuahuan Desert with rocky sandy-loam soil and *Agave* and *Fouquieria* (Henrickson).

In Durango: scattered on *Larrea* deserts (Stuessy).

In San Luis Potosi: on deserts with *Larrea* and *Yucca* dominant (Richardson).

The *Clerodendrum nelmesianum*, listed in the synonymy (above), is based on an unnumbered Ludwig Hahn collection from somewhere in Mexico, gathered in 1865 or 1866, and deposited in the Paris herbarium. It was named in honor of Ernest Nelmes, librarian at the Royal Botanic Gardens, Kew, botanical bibliographer and expert on the *Cyperaceae*.

Material of *T. coulteri* f. *angustifolia* has been misidentified and distributed in many herbaria as typical *T. coulteri* A. Gray and in some as *Teucrium laciniatum* Torr. On the other hand, the *Lundell & Lundell 14183, C. H. Muller 8412, Smith & Butterwick 76,* and *Waterfall s.n.* [August 11, 1959], distributed as f. *angustifolia,* actually seem better regarded as representing the typical *T. coulteri* A. Gray.

Citations: TEXAS: Andrews Co.: *T. Collins 1297* (Lk). Brewster Co.: *Butterwick & Lott 3675* (Au); *Correll & Johnston 19350* (Ld); *L. C. Higgins 6778* (N); *Lundell & Lundell 14210* (Ld, N); *A. R. Moldenke 170* (Z); *C. M. Rowell 5109* (Lk); *Steiger 31* (N), *416* (N), *1090* (N); *Warnock 5550* (Au--127188), *21233* (Au--127190); *Warnock & Hinckley BG.184* (Ld). Crane Co.: *Tharp s.n.* [7/11/41] (Au--127198); *Warnock 14654* (Au--127975, Ld). Culberson Co.: *Correll & Johnston 18558* (Ld); *Janszen 413* (Au--127185); *Small & Wherry 12082* (N); *Tharp & Jabszen 49-1181* (Au--127205); *Waterfall 3765* (N), *4457* (Au--298068, N), *7757* (N); *Whitehouse 16883* (Mi, Sm). Ector Co.: *T. Collins 1030* (Lk). El Paso Co.: *Vasey s.n.* [El Paso, Mch. 1881] (Pa); *Warnock 5777* (Au--127495, Ld), *13673* (Ld). Hudspeth Co.: *D. S. Correll 26584* (Ld); *Ferris & Duncan 2492*(Gg--24500, N); *A. R. Moldenke 161* (Fg, S); *Powell 2423* (Au); *Tharp 43-823* (Au--127212). Jeff Davis Co.: *A. R. Moldenke 166* (Fg). Midland Co.: *Tracy 7988* (Au--127199). Pecos Co.: *Cory 40294* (Au--127213); *Warnock 7860* (Au--127189, Au--127204, Ld), *46157* (Au--127203). Presidio Co.: *Correll & Rollins 23692* (Ld); *Eggleston 17309* (N); *Hinckley 1728* (Au--127196); *Lundell & Lundell 14289* (Sm); *C. H. Muller 8412* (Ld, N, Sm); *Warnock 20706* (Au--127197), *20722* (Au--127207); *York 50-90* (Au--127183), *48278* (Au--127216). Terrell Co.: *E. J. Palmer 33520* (N); *Turner & Butterwick 510* (Ld); *Warnock & McBryde 14862* (Au--127974, Ld). Ward Co.: *F. S. Earle s.n.* [Barstow, June 1901] (N); *Powell 2194* (Au); *T. A. Williams s.n.* [May 19, 1900] (Ld). Winkler Co.: *T. Collins 1087* (Lk), *1221* (Lk); *C. M. Rowell 8270* (Lk), *8298* (Lk, Lk), *11548* (Lk). NEW MEXICO: Chaves Co.: *Earle & Earle 292* (N). Culberson Co.: *Waterfall 7757* (N). Dona Ana Co.: *Wooton s.n.* [Aug. 26, 1899] (N). Eddy Co.: *Higgins 6706* (N); *Smith, Butterwick, & Whalen 331* (Ld); *Whitehouse 11480* (Sm), *s.n.* [July 7, 1931] (Au--127220). Hidalgo Co.: *McGill & Keil 8501* (N); *A. R. Moldenke 141* (Am, B, Fg, S). Luna Co.: *Mulford 1039* (N). Otero Co.: *M. C. Johnston 2730* (Au--127219). Sierra Co.: *O. B. Metcalfe 1280* (N). Socorro Co.: *H. H. Rusby 347* (Mi). ARIZONA: Cochise Co.: *Thornber 9198* (St). Pima Co.: *Rothrock 588* (Pa); *Wooton s.n.* [Tucson, July 8, 1911] (N). MEXICO: Chihuahua: *Engard & Gentry 625* (Ld); *Henrickson 5678* (Ld); *LeSueur Mex.803* (Au--127221); *Moldenke & Moldenke 2109* (Ac, Ld); *Waterfall 12500* (Mi, St); *S. S. White 2048* (Mi), *2188* (Mi), *2451* (Mi). Coahuila: *Henrickson 6202* (Ld), *6968* (Ld); *I. M. Johnston 2602a* (Au--127222), *8569* (Ld); *Lehto, Keil, & Pinkava 5315* (Ld, Te--67197), *5537* (Te--67198), *5661* (Te--67195), *5675* (Te--67199), *5798* (Te--67200); *Edw. Palmer 1104* (Pa); *R. M. Stewart 609* (Ld), *1334* (Ld--299892). Durango: *Correll & Johnston 19989* (Ld); *Gregg*

502 (T); *Stuessy 945* (Au--257660). San Luis Potosí: *Paray 2625* (Ip); *C. C. Parry 726* (Pa); *Richardson 1554* (Au); *J. Rzedowski 6356* (Ip), *7991* (Ip, Ip), *9386* (Ip). State undetermined: *Hahn s.n.* (F, N, N--photo, P, Z--photo).

TETRACLEA COULTERI f. *SUBINCLUSA* (I. M. Johnst.) Mold., Phytol. Mem. 2: 445. 1980, stat. nov.

Synonymy: *Tetraclea subinclusa* I. M. Johnst., Journ. Arnold Arb. 31: 192. 1950. *Tetraclea coulteri* var. *subinclusa* (I. M. Johns.) Mold., Phytologia 38: 499. 1978.

Bibliography: I. M. Johnst., Journ. Arnold Arb. 31: 192--193. 1950; E. J. Salisb., Ind. Kew. Suppl. 11: 250. 1953; Mold., Biol. Abstr. 66: 1277. 1978; Mold., Phytologia 38: 499. 1978; Hocking, Excerpt. Bot. A.33: 79. 1979; Mold., Phytol. Mem. 2: 67, 445, & 578. 1980.

A low, often prostrate, perennial herb, abundantly clothed with minute retrorse hairs; stems loosely ascending or prostrate, 5--15 cm. long, very sparsely or hardly at all branched, issuing from a heavy, deep taproot; principal internodes 5--22 mm. long; petioles often 2--10 mm. long; leaf-blades ovate or lanceolate, 1--2 cm. long, 5--18 mm. wide, widest below the middle, apically acute or rounded to gradually attenuate, marginally entire, basally obtuse or acute and abruptly or gradually attenuate into the petiole, somewhat paler beneath, often whitish and with a few inconspicuous veins; pedicles 1--3 mm. long; calyx-lobes during anthesis cuneate, 6--8 mm. long; corolla large, conspicuous, yellow or becoming purplish, its tube 1.6--1.7 cm. long, 1.5--2 mm. wide, twice as long as the calyx, externally glabrous, internally more or less villosulous except above the middle, the lobes obovate, 6--7 mm. long, 2.5--3.5 mm. wide; filaments straight, 6.5--9 mm. long, very slightly exserted, subglabrous or else villosulous below the middle, inserted 2.5--3 mm. below the mouth of the corolla-tube, exserted 2--5 mm. from the mouth, reaching the middle of or almost to the apex of the erect upper corolla-lobe; anthers oblong, 1.2--1.9 mm. long, 0.5--0.9 mm. wide; seeds 4--5 mm. long.

This form is based on *I. M. Johnston 8504*, local on limestone beds between gypsum strata on an escarpment at the south end of Canada Oscuro, near Tanque La Luz, Coahuila, Mexico. Johnston (1950) cites also *Johnston & Muller 741* and *Stewart 2830* from Coahuila. He comments that "Although evidently related to the polymorphic *T. Coulteri* Gray, the present plant differs in its very large corollas in which the tube is about twice as long as the calyx and the stamens are straight and are exserted less than 5 mm. from the corolla-tube and not beyond the usually erect dorsal corolla-lobes. In Coahuila the common form of the genus is that described as *T. angustifolia* Woot. & Standl., a loosely branched usually erect plant with narrow toothed leaves and small corollas with much curved long-protruding stamens. The proposed species is most like typical *T. Coulteri* of Hidalgo, San Luis Potosí and Tamaulipas, which also has broad entire leaves but a looser growth habit and very much smaller corollas with well exserted stamens."

Stewart refers to the plant as "scarce", with a bad odor. Other collectors have found it growing prostrate on limestone ledges on small hillsides, in arroyos, on gypsum flats, in limestone crevices, on rocky slopes, and on limestone between gypsum strata on escarpments, in anthesis from May to August, and in fruit in July. The corolla is described as having been "yellow" on *Johnston & Muller 741* and *Stewart 2830,* "cream" on *Correll & Johnston 20205,* and "reddish-purple" on *Johnston 8504.*

Material of this form has been misidentified and distributed in some herbaria as typical *T. coulteri* A. Gray.

Citations: MEXICO: Coahuila: *Johnston & Muller 741* (Ld--301250); *Powell & Turner 2724* (Ld). Colima: *I. M. Johnston 8504* (Ld--302196--isotype, Z--isotype). Durango: *Correll & Johnston 20205* (Ld).

TETRACLEA VISCIDA Lundell, Am. Midl. Nat. 29: 489--490. 1943.

Bibliography: C. L. Lundell, Am. Midl. Nat. 29: 489--490. 1943; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 23 & 197. 1949; E. J. Salisb., Ind. Kew. Suppl. 11: 250. 1953; Mold., Résumé 28 & 470. 1959; Mold., Résumé Suppl. 3: 7. 1962; Mold. in Correll & Johnst., Man. Vasc. Pl. Tex. [Contrib. Tex. Res. Found. 6:] 1342 & 1873. 1970; Mold., Fifth Summ. 1: 57 & 63 (1971) and 2: 911. 1971: Mold., Phytol. Mem. 2: 50, 56, & 578. 1980.

An erect viscid annual herb, about 45 cm. tall, densely puberulent with gland-tipped hairs; stems and main branches drying reddish-purple; branchlets green, subterete; leaves decussate-opposite, sessile or subsessile; petioles if present not over 3 mm. long, margined; leaf-blades thickly chartaceous, probably fleshy when fresh, narrowly elliptic, 5--18 mm. long, to 9 mm. wide, broadest at the middle, apically acute, marginally entire, basally acute, glandular-puberulent on both surfaces, with some coarser eglandular hairs intermixed, 3-veined from the base; cymes axillary, pedunculate, 1- or 2-flowered; peduncles to 1 cm. long in the fruiting stage; pedicels not over 1 mm. long; the peduncles, pedicels, bracts, and calyx glandular-puberulent and sparsely hirsute with incurved hairs; calyx campanulate, 4- or 5-lobed, 8- or 10-veined, accrescent and to 8 mm. long in fruit, lobed to below the middle, the lobes lanceolate, attenuate to the acute apex; corolla apparently less than 5 mm. long but only known from the bud stage, the 4 outer lobes pubescent above the middle externally, the lower lobe with a line of hairs along the midvein; stamens 4, exserted; ovary apically shallowly 4-lobed; style apically bifid, the branches subulate, equal, reflexed; pyrenes small, hard, obovoid, reticulate-rugose, attached only basally, apically minutely puberulent.

The type of this species was collected by Forrest Shreve (*no. 9917*) nineteen miles northwest of Uvalde, Uvalde County, Texas, at 1200 feet altitude, on September 11, 1940, and is deposited in the herbarium of the University of Michigan at Ann Arbor, Michigan.

Warnock describes the plant as "rare" in limestone soil of Travis County. It has been encountered at 400--1710 m. altitude, flowering and fruiting in September and October.

Material has been misidentified and distributed in some herbaria as *T. coulteri* A. Gray and as *Scrophularia parviflora* Woot. & Standl.

Citations: TEXAS: Travis Co.: *Albers & Haskell 49278* (Au--262712); *Warnock 45-14* (Au--1659311). Uvalde Co.: *Shreve 9917* (F--photo of type, Mi--type, N--isotype, N--photo of type, Sg--photo of type, Z--photo of type). ARIZONA: Gila Co.: *Collom s.n.* [Barnhart Pass] (Mi).

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ADDITIONAL NOTES ON THE GENUS *VITEX* XVIII

Harold N. Moldenke

VITEX Tourn.

Additional & emended bibliography: Sandm. in L., Amoen. Acad. 5: 380. 1759; Neck., Elem. Bot. 1: 353. 1790; Roxb., Hort. Beng., imp. 1, 46 & [95]. 1814; Poir. in Lam., Tabl. Encycl. Méth. Bot. 3: pl. 541, fig. 1 & 2 (1819) and 3: 56. 1823; Loud., Hort. Brit., ed. 1, 246 & 529 (1830) and ed. 2, 246 & 529. 1832; Roxb., Fl. Ind., ed. 2, imp. 1, 3: 60--75. 1832; Blanco, Fl. Filip., ed. 3, 513--517. 1837; G. Don in Loud., Hort. Brit., ed. 3, 246 & 529. 1839; G. Don in Sweet, Hort. Brit., ed. 3, 550--551. 1839; Endl., Gen. Pl. 2: 1501. 1841; A. L. Juss. in Orbigny, Dict. Univ. Hist. Nat. 13: 185. 1849; Miq., Fl. Ind. Bat. Suppl. 1: 95, 242, & 567--568. 1860; Peters, Naturwiss. Reise Mossamb. 6 (1): Bot. 256 & 265--266. 1861; Ulrich, Internat. Wörterb., ed. 1, 254. 1871; Pritz., Thes. Lit. Bot., imp. 1, 245. 1872; Brandis, Forest Fl. Northw. Cent. India 369--370 & 577. 1874; Firminger, Man. Gard. India, ed. 3, 326 & 620. 1874; Pfeiffer, Nom. Bot. 1 (2): 1592--1593 & 1836 (1874), 2 (1): 24 & 25 (1874), and 2 (2): 1569, 1570, 1593, & 1605. 1874; Roxb., Fl. Ind., ed. 2, imp. 2, 481--483. 1874; Ulrich, Internat. Wörterb., ed. 2, 254. 1875; Naves & Fern.-Villar in Blanco, Fl. Filip., ed. 3, 6: pl. 226--228 & 427. 1878; Boiss., Fl. Orient., imp. 1, 4: 535. 1879; Naves & Fern.-Villar in Blanco, Fl. Filip., ed. 3, 4: 159--160. 1880; Franch., Pl. David., imp. 1, 1: 232. 1884; Hillebrand, Fl. Hawai. Isls., imp. 1, 340 & 342. 1888; Stahl, Estud. Fl. Puerto Rico, ed. 1, 3: 287, 296--297, & 371. 1888; Forbes & Hemsl., Journ. Linn Soc. Lond. Bot. 26 [Ind. Fl. Sin. 2]: 257--259. 1890; Baill., Hist. Pl. 11: 85--88, 94, 95, 110, 112, & 116, fig. 93--96. 1891; J. C. Willis, Dict. Flow. Pl., ed. 2, 604 & 608. 1903; Post & Kuntze, Lexicon 589 & 688. 1904; J. C. Willis, Dict. Flow. Pl., ed. 3. imp, 1, 621 & 625. 1908; D. H. Scott in Solered., Syst. Anat. Dicot. [transl. Boodle & Fritsch] 2: 1021 & 1022. 1908; Stopes, Cat. Mesoz. Pl. 225. 1913; J. C. Willis, Dict. Flow. Pl., ed. 3, imp. 2, 621 & 625. 1914; Thonner, Flow. Pl. Afr. 470. 1915; R. E. Fries, Wiss. Ergebn. Schwed. Rhodes.-Kong. Exped. Bot. 2 (2): 273--274. 1916; Saxton & Sedgewick, Rec. Bot. Surv. India 7: 291.